SECTION 18360
PIPE WELDER PERFORMANCE QUALIFICATION TESTS FOR TARGET BUILDING SYSTEMS.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Requirements for the qualification of welders and welding operators on-site in accordance with ASME B31.3 and Section. IX.

1.2 RELATED SECTIONS

A. Section 18100, General Welding Requirements.

B. Section 18310, General Pipe Welding Requirements.

C. Section 18350, Pipe Welding Procedure Specifications.

PART 2 - PRODUCTS

2.1 SEE SECTION 18100, GENERAL WELDING REQUIREMENTS

PART 3 - EXECUTION

3.1 TEST REQUIREMENTS

A. Contractor’s welders test at the Y-12 weld test shop to the standard PQTs described in this specification which require the use of WPSs from Section 18350.

B. PQTs are intended to determine the ability of welders and welding operators to deposit sound welds in accordance with a qualified welding procedure.

C. Each welder and welding operator must pass a PQT in accordance with this specification prior to welding on components or assemblies which are fabricated in accordance with ASME.

D. The weld test shop completes and maintains a record of qualification tests, including those which failed to meet requirements, including the test conditions and results.

E. After each welder or welding operator successfully completes the requirements of a test, assign an identification number, letter or symbol to use to identify work performed by the welder or welding operator. If the welder was previously qualified, use the active identification.

F. Welders or welding operators who pass (PQTs) for groove welds are qualified to weld on groove welds within the limitations of the test description. (Stipulated thickness limitations for groove welds refer to deposited weld metal thickness.) Such welder or welding operators are also qualified to make fillet welds of any size.

G. Base materials qualified by applicable PQTs are as specified in ASME Section IX, Paragraph QW-423.

3.2 RETESTS

A. A welder or welding operator who fails to meet requirements of a test may be retested under either of the following conditions:
   1. An immediate retest may be made consisting of two consecutive test welds of each type and for each position on which tests failed to meet requirements. The testing requirements for the original test (i.e., mechanical tests or radiographic examination) apply.
   2. A complete retest may be made when the welder or welding operator has had additional training or practice for a minimum of 2 h.

B. The test supervisor determines the conditions for retest as required by paragraph 3.2 A.

3.3 RENEWAL OF QUALIFICATION

A. A welder or welding operator maintains a qualification(s) by welding with the process(es) or by performing a renewal test (update) in accordance with paragraph 3.3 B.

B. The renewal qualification test is required under the following conditions.
   1. When the welder or welding operator has not used the welding process (shielded metal arc, gas tungsten arc, etc.) for a period of more than 6 months but less that 1 year.
   2. When there are specific reasons to question the welder or welding operator's ability to produce welds that meet the specification requirements.

C. The renewal test requires the welder to successfully complete one test on the smallest diameter material previously qualified to weld in the most restrictive position using that process. Failure of this test requires the welder to requalify for each performance qualification test needed for that process.

D. Qualifications expired for longer than a year must complete each performance qualification test needed.

E. The ability of welders or welding operators to meet specification requirements may be questioned by the test supervisor or his designee at any time.

3.4 F-NUMBERS

A. F-numbers used for electrode and filler metal identification purposes in this specification are those of ASME Section IX, paragraph QW-432.

3.5 TEST DESCRIPTION

A. Each test description de3fines the requirements to be followed in performance of tests in accordance with the qualified WPS.
   1. The term "carbon steel" as used in test descriptions refers to P-number 1 materials listed in ASME Code, Section IX, paragraph QW-422
   2. As permitted by ASME Section IX, paragraph QW-423, some test descriptions may utilize base materials other than those indicated on the applicable WPS.
   3. When test descriptions specify a particular type or grade of stainless steel electrode/filler metal and base material, other types or grades may be substituted if and as permitted by the applicable WPS.
   4. When test descriptions require testing in multiple positions, one test coupon in each position is required.

5. Tests are generally written to qualify welders for all positions. Welders may qualify for limited positions. Use Table 1 to determine the position restrictions.

B. Each test description specifies the mechanical test and/or other tests required in order to pass the test.

C. Test descriptions are numbered and lettered to indicate the welding process. F-number of electrode or filler metal, weld joint type, pipe diameter, and a symbol or letter indicating the thickness range qualified.

D. For all test descriptions for groove welds with base metal thickness from 3/8 in. but less than ¾ in., the following apply:
1. Root and face bend tests in accordance with ASME Section IX, figure QW462.3(a), may be substituted for side bend tests.
2. Side bend tests in accordance with ASME Section IX, figure QW462.2, may be substituted for root and face bend tests.
3. When preparing bend specimens, tolerances for the thickness dimension are not more than 1/32 inch under nor 1/16 inch over the nominal dimensions given in figure QW-462 of ASME Section IX.

E. Each test description contains a written description of the limits of qualification of a welder or welding operator who passes the test. The qualification limits provided by some tests may be greater or less than the qualified limits of a particular WPS which the welder may subsequently use for production welds. Production welds must be made within the qualified limit of both the welder/welding operator PQT and WPS.

F. Welders qualified to test descriptions using the gas metal arc process are qualified only for the transfer mode (globular or short circuiting) used in the test.

G. For qualification, use one of the weld joint details provided in section 18370, which is available from the Construction Manager upon request.

3.6 ACCEPTANCE STANDARDS

A. Acceptance standards for guided bend tests are in accordance with ASME Section IX, paragraph QW-160.

B. Acceptance standards for fillet weld tests are in accordance with ASME Section IX, paragraph QW-180.

C. Acceptance standards for radiography of welder or welding operator tests are in accordance with ASME Section IX, paragraph WQ-190.

D. Any test which shows evidence on any weld surface of cracks, lack of fusion, incomplete penetration (when full penetration is required), or sugaring (root oxidation) is considered failed.

E. Tests performed on steel backing which show evidence of burn through or melt through are considered failed.

3.7 PRODUCTION WELDS USING MORE THAN ONE WELDER

A. Production welds may be performed by one or more welders or welding operators. The welder or welding operator may perform only that portion of the production weld for which he has been qualified.

Table 1. Matrix to determine positions qualified

Code type test	Position(s) passed	Fillet welds		Groove welds		
		Plate Position	Pipe (any size) Position	Plate & pipe >24 in. Position	Pipe Diam (OD)	Position
ASME Plate	1G	F	F	F	≥2.875 - 24	F
	2G	F, H	F, H	F, H	≥2.875 - 24	F, H
	3G	F, H, V	F, H, V	F, V	≥2.875 - 24	F
	4G	F, H, O	F, H, O	F, O	≥2.875 - 24	F
	3G, 4G	All	All	F, V, O	≥2.875 - 24	F
	2G, 3G, 4G	All	All	All	≥2.875 - 24	F, H
ASME 1/4-in. Tubing	2G	F, H	F, H	F, H	≥0.250	F, H
	5G	All	All	F, V, O	≥0.250	F, V, O
	2G, 5G	All	All	All	≥0.250	All
	6G	All	All	All	≥0.250	All
ASME 1/4-in. (NPS) Pipe	2G	F, H	F, H	F, H	≥0.540	F, H
	5G	All	All	F, V, O	≥0.540	F, V, O
	2G, 5G	All	All	All	≥0.540	All
	6G	All	All	All	≥0.540	All
ASME 1/2-in. (NPS) Pipe	2G	F, H	F, H	F, H	≥0.840	F, H
	5G	All	All	F, V, O	≥0.840	F, V, O
	2G, 5G	All	All	All	≥0.840	All
	6G	All	All	All	≥0.840	All
ASME 2-in. (NPS) Pipe	2G	F, H	F, H	F, H	≥1.000	F, H
	5G	All	All	F, V, O	≥1.000	F, V, O
	2G, 5G	All	All	All	≥1.000	All
	6G	All	All	All	≥1.000	All
ASME 5-in. (NPS) Pipe	2G	F, H	F, H	F, H	≥2.875	F, H
	5G	All	All	F, V, O	≥2.875	F, V, O
	2G, 5G	All	All	All	≥2.875	All
	6G	All	All	All	≥2.875	All

PIPING PQT/WPS CROSS REFERENCE

PQT	WPS	THICKNESS		MIN DIAMETER OD	COMMENTS
		MIN MATERIAL (WPS)	MAX DEPOSIT		
SM-3-0-1	SM11-2(PP)	0.062	0.436	1.000	
SM-3-0-2	SM11-2(PP)	0.062	0.750	2.875	
SM-4-B-1	SM11-1(PP)	0.062	0.436	1.000	
	SM11-2(PP)	0.062	0.436	1.000	Rem Only
SM-4-B-2	SM11-1(PP)	0.062	0.750	2.875	
	SM11-2(PP)	0.062	0.750	2.875	Rem Only
SM-5-B-1	SM18-2(PP)	0.062	0.436	1.000	
	SM88-1(PP)	0.062	0.436	1.000	
SM-5-B-2	SM18-2(PP)	0.062	0.750	2.875	
	SM88-1(PP)	0.062	0.750	2.875	
SM-5-B-L	SM18-2(PP)	0.062	0.750	>24	
	SM88-1(PP)	0.062	0.750	>24	
GT-6-0-T/4	GT88-1(PP)	0.035	0.070	0.250	
GT-6-O-1/4	GT11-1(PP)	0.062	0.176	0.540	
	GT18-2(PP)	0.062	0.176	0.540	
	GT88-1(PP)	0.035	0.176	0.540	

PQT/WPS CROSS REFERENCE

PQT	WPS	THICKNESS		MIN DIAMETER OD	COMMENTS
		MIN ATERIAL (WPS)	MAX DEPOSIT		
GT-6-0-1/2	GT11-1(PP)	0.062	0.294	0.840	
	GT18-2(PP)	0.062	0.294	0.840	
	GT88-1(PP)	0.035	0.294	0.840	
GT-6-0-1	GT11-1(PP)	0.062	0.436	1.000	
	GT18-2(PP)	0.062	0.436	1.000	
	GT88-1(PP)	0.035	0.436	1.000	
GT-6-0-2	GT11-1(PP)	0.062	0.750	2.875	
	GT18-2(PP)	0.062	0.750	2.875	
	GT88-1(PP)	0.035	0.750	2.875	
GT-FC-0-1	GT88-2(PP)	0.062	0.436	1.000	Flux-Coated Rod
GT-FC-0-2	GT88-2(PP)	0.062	0.750	2.875	Flux-Coated Rod
GT-6-B-L	GT11-1(PP)	0.062	0.750	>24	
	GT18-2(PP)	0.062	0.750	>24	
	GT88-1(PP)	0.035	0.750	>24	
GT-23-O-L	GT23.23-1(PP)	0.062	0.250	>24	
GT-23-O-1	GT23.23-1(PP)	0.062	0.308	1.000	
GT-23-O-2	GT23.23-1(PP)	0.062	0.750	2.875	
GT-23-B-LA	GT23.23-2(PP)	0.062	0.750	>24	
GT-23-O-1A	GT23.23-2(PP)	0.062	0.308	1.000	
GT-23-O-2A	GT23.23-2(PP)	0.062	0.750	2.875	
GM-6-B-L	GM88-1(PP)	0.062	0.750	>24	
GM-23-B-L	GM23.23-1(PP)	0.062	0.750	>24	
GM-23-B5S-2	GM23.23-1(PP)	0.062	0.516	2.875	

PIPE WELDING PERFORMANCE QUALIFICATION TEST (PQT)

TEST NUMBER: SM-3-O-1		REVISION 1
1.	WELDING PROCESS:	SMAW (Manual)
2.	ELECTRODE/FILLER MATERIAL:	E6010 (F-number 3)
3.	BASE MATERIAL:	Carbon Steel Pipe (P-number 1), 2 in. NPS, Sch. 80 (0.218 in. W.T.) without backing
4.	WELDING POSITION(S):	2G and 5G, or 6G
5.	VERTICAL WELDING PROGRESSION:	Upward
6.	WELDING PROCEDURE:	SM11-2 (PP)
7.	INSPECTION:	See paras. 3.6 D and E
8.	TESTS(S):	2G requires one face and one root bend; 5G or 6G requires two face and two root bends (ASME IX, para. QW-302.3); or, radiographic examination per ASME IX, para. QW-302.2

LIMITS OF QUALIFICATION:

1.	PROCESS:	SMAW
2.	ELECTRODE/FILLER METAL:	F3
3.	BASE MATERIAL:	P1 through P11 and P4X
4.	POSITION(S):	All
5.	PIPE GROOVE WELD DIAM LIMITS:	1 in. OD (3/4 in. NPS) and larger
6.	JOINT TYPES:	Groove welds with or without backing or backgouged and fillet welds
7.	DEPOSITED METAL THICKNESS:	Through 0.436 in.
8.	PRODUCT FORM:	Pipe, plate, and shapes

PIPE WELDING PERFORMANCE QUALIFICATION TEST (PQT)

TEST NUMBER: SM-3-O-2 REVISION 1

1.	WELDING PROCESS:	SMAW (Manual)
2.	ELECTRODE/FILLER MATERIAL:	E6010 (F-number 3)
3.	BASE MATERIAL:	Carbon Steel Pipe (P-number 1), 5 in. NPS, Sch. 80 (0.375 in. W.T.) without backing
4.	WELDING POSITION(S):	2G and 5G, or 6G
5.	VERTICAL WELDING PROGRESSION:	Upward
6.	WELDING PROCEDURE:	SM11-2 (PP)
7.	INSPECTION:	See paras. 3.6 D and E
8.	TESTS(S):	2G requires two side bends or one face and one root bend; 5G or 6G requires four side bends or two face and two root bends (ASME IX, para. QW-302.3); or, radiographic examination per ASME IX, para. QW-302.2

LIMITS OF QUALIFICATION:

1.	PROCESS:	SMAW
2.	ELECTRODE/FILLER METAL:	F3
3.	BASE MATERIAL:	P1 through P11 and P4X
4.	POSITION(S):	All
5.	PIPE GROOVE WELD DIAM LIMITS:	2 7/8 in. OD (2 1/2 in. NPS) and larger
6.	JOINT TYPES:	Groove welds with or without backing or backgouged and fillet welds
7.	DEPOSITED METAL THICKNESS:	Through 0.750 in.
8.	PRODUCT FORM:	Pipe, plate, and shapes

PIPE WELDING PERFORMANCE QUALIFICATION TEST (PQT)

TEST NUMBER: SM-4-B-1 REVISION 1

1.	WELDING PROCESS:	SMAW (Manual)
2.	ELECTRODE/FILLER MATERIAL:	E7018 (F-number 4)
3.	BASE MATERIAL:	Carbon Steel Pipe (P-number 1), 2 in. NPS, Sch. 80 (0.218 in. W.T.) with backing
4.	WELDING POSITION(S):	2G and 5G, or 6G
5.	VERTICAL WELDING PROGRESSION:	Upward
6.	WELDING PROCEDURE:	SM11-1 (PP)
7.	INSPECTION:	See paras. 3.6 D and E
8.	TESTS(S):	2G requires one face and one root bend; 5G or 6G requires two face and two root bends (ASME IX, para. QW-302.3); or, radiographic examination per ASME IX, para. QW-302.2

LIMITS OF QUALIFICATION:

1.	PROCESS:	SMAW
2.	ELECTRODE/FILLER METAL:	F1 through F4
3.	BASE MATERIAL:	P1 through P11 and P4X
4.	POSITION(S):	All
5.	PIPE GROOVE WELD DIAM LIMITS:	1 in. OD (3/4 in. NPS) and larger
6.	JOINT TYPES:	Groove welds with backing or backgouged and fillet welds
7.	DEPOSITED METAL THICKNESS:	Through 0.436 in.
8.	PRODUCT FORM	Pipe, plate, and shapes

PIPE WELDING PERFORMANCE QUALIFICATION TEST (PQT)

TEST NUMBER: SM-4-B-2 REVISION 1

1.	WELDING PROCESS:	SMAW (Manual)
2.	ELECTRODE/FILLER MATERIAL:	E7018 (F-number 4)
3.	BASE MATERIAL:	Carbon Steel Pipe (P-number 1), 5 in. NPS, Sch. 80 (0.375 in. W.T.) with backing
4.	WELDING POSITION(S):	2G and 5G, or 6G
5.	VERTICAL WELDING PROGRESSION:	Upward
6.	WELDING PROCEDURE:	SM11-1 (PP)
7.	INSPECTION:	See paras. 3.6 D and E
8.	TESTS(S):	2G requires two side bends or one face and one root bend; 5G or 6G requires four side bends or two face and two root bends (ASME IX, para. QW-302.3); or, radiographic examination per ASME IX, para. QW-302.2

LIMITS OF QUALIFICATION:

1.	PROCESS:	SMAW
2.	ELECTRODE/FILLER METAL:	F1 through F4
3.	BASE MATERIAL:	P1 through P11 and P4X
4.	POSITION(S):	All
5.	PIPE GROOVE WELD DIAM LIMITS:	2 7/8 in. OD (2 1/2 in. NPS) and larger
6.	JOINT TYPES:	Groove welds with backing or backgouged and fillet welds
7.	DEPOSITED METAL THICKNESS:	Through 0.750 in.
8.	PRODUCT FORM:	Pipe, plate, and shapes

PIPE WELDING PERFORMANCE QUALIFICATION TEST (PQT)

TEST NUMBER: SM-5-B-1 REVISION 1

1.	WELDING PROCESS:	SMAW (Manual)
2.	ELECTRODE/FILLER MATERIAL:	E309/309L or 16 (F-number 5)
3.	BASE MATERIAL:	Carbon Steel Pipe (P-number 1), 2 in. NPS, Sch. 80 (0.218 in. W.T.) with backing
4.	WELDING POSITION(S):	2G and 5G, or 6G
5.	VERTICAL WELDING PROGRESSION:	Upward
6.	WELDING PROCEDURE:	SM18-2 (PP)
7.	INSPECTION:	See paras. 3.6 D and E
8.	TESTS(S):	2G requires one face and one root bend; 5G or 6G requires two face and two root bends (ASME IX, para. QW-302.3); or, radiographic examination per ASME IX, para. QW-302.2

LIMITS OF QUALIFICATION:

1.	PROCESS:	SMAW
2.	ELECTRODE/FILLER METAL:	F5
3.	BASE MATERIAL:	P1 through P11 and P4X
4.	POSITION(S):	All
5.	PIPE GROOVE WELD DIAM LIMITS:	1 in. OD (3/4 in. NPS) and larger
6.	JOINT TYPES:	Groove welds with backing or backgouged and fillet welds
7.	DEPOSITED METAL THICKNESS:	Through 0.436 in.
8.	PRODUCT FORM:	Pipe, plate, and shapes

PIPE WELDING PERFORMANCE QUALIFICATION TEST (PQT)

TEST NUMBER: SM-5-B-2 REVISION 2

1.	WELDING PROCESS:	SMAW (Manual)
2.	ELECTRODE/FILLER MATERIAL:	E309/309L or 16 (F-number 5)
3.	BASE MATERIAL:	Carbon Steel Pipe (P-number 1), 5 in. NPS, Sch. 80 (0.375 in. W.T.) with backing
4.	WELDING POSITION(S):	2G and 5G, or 6G
5.	VERTICAL WELDING PROGRESSION:	Upward
6.	WELDING PROCEDURE:	SM18-2 (PP) (R)
7.	INSPECTION:	See paras. 3.6 D and E
8.	TESTS(S):	2G requires two side bends or one face and one root bend; 5G or 6G requires four side bends or two face and two root bends (ASME IX, para. QW-302.3); or, radiographic examination per ASME IX, para. QW-302.2

LIMITS OF QUALIFICATION:

1.	PROCESS:	SMAW
2.	ELECTRODE/FILLER METAL:	F5
3.	BASE MATERIAL:	P1 through P11 and P4X
4.	POSITION(S):	All
5.	PIPE GROOVE WELD DIAM LIMITS:	2 7/8 in. OD (2 1/2 in. NPS) and larger
6.	JOINT TYPES:	Groove welds with backing or backgouged and fillet welds
7.	DEPOSITED METAL THICKNESS:	Through 0.750 in.
8.	PRODUCT FORM:	Pipe, plate, and shapes

PIPE WELDING PERFORMANCE QUALIFICATION TEST (PQT)

TEST NUMBER: SM-5-B-L REVISION 2

1.	WELDING PROCESS:	SMAW (Manual)
2.	ELECTRODE/FILLER MATERIAL:	E309/309L - 15 or 16 (F-number 5)
3.	BASE MATERIAL:	Carbon Steel Plate (P-number 1), 3/8 in. thick X 3 in. wide X 6 in. long, with backing
4.	WELDING POSITION(S):	2G, 3G, and 4G
5.	VERTICAL WELDING PROGRESSION:	Upward
6.	WELDING PROCEDURE:	SM18-2 (PP) (R)
7.	INSPECTION:	See paras. 3.6 D and E
8.	TESTS(S):	Two side bends or one face and one root bend test from each test position per ASME IX, para. QW-302-1; or, radiographic examination per ASME IX, para. QW-302.2

LIMITS OF QUALIFICATION:

1.	PROCESS:	SMAW
2.	ELECTRODE/FILLER METAL:	F5
3.	BASE MATERIAL:	P1 through P11 and P4X
4.	POSITION(S):	All
5.	PIPE GROOVE WELD DIAM LIMITS:	Greater than 24-in. OD
6.	JOINT TYPES:	Groove welds with backing or backgouged and fillet welds
7.	DEPOSITED METAL THICKNESS:	Through 0.750 in.
8.	PRODUCT FORM:	Pipe over 24-in. OD, plate, and shapes

PIPE WELDING PERFORMANCE QUALIFICATION TEST (PQT)

TEST NUMBER: GT-6-O-T/4 REVISION 1

1.	WELDING PROCESS:	GTAW (Manual)
2.	ELECTRODE/FILLER MATERIAL:	ER308 or ER308L (F-number 6)
3.	BASE MATERIAL:	Stainless Steel Tube (P-number 8), 1/4 in. OD X 0.035 in. W.T., without backing
4.	WELDING POSITION(S):	2G and 5G, or 6G
5.	VERTICAL WELDING PROGRESSION:	Upward
6.	WELDING PROCEDURE:	GT88-1 (PP), welded with purge
7.	INSPECTION:	See paras. 3.6 D and E
8.	TESTS(S):	2G requires one face and one root bend; 5G or 6G requires two face and two root bends (ASME IX, para. QW-302.3); or, radiographic examination of four test coupons per ASME IX, para. QW-302.2

LIMITS OF QUALIFICATION:

1.	PROCESS:	GTAW, DCSP, with purge
2.	ELECTRODE/FILLER METAL:	F6
3.	BASE MATERIAL:	P1 through P11 and P4X
4.	POSITION(S):	All
5.	PIPE GROOVE WELD DIAM LIMITS:	0.250 in. OD and larger
6.	JOINT TYPES:	Groove welds with or without backing or backgouged and fillet welds. Not consumable inserts
7.	DEPOSITED METAL THICKNESS:	Through 0.070 in.
8.	PRODUCT FORM:	Pipe, plate, and shapes

PIPE WELDING PERFORMANCE QUALIFICATION TEST (PQT)

TEST NUMBER: GT-6-O-1/4		REVISION 1
1.	WELDING PROCESS:	GTAW (Manual)
2.	ELECTRODE/FILLER MATERIAL:	ER70S-2 or ER70S-3 (F-number 6)
3.	BASE MATERIAL:	Carbon Steel Pipe (P-number 1), 1/4 in. NPS, Sch. 40 (0.088 in. W.T.) without backing
4.	WELDING POSITION(S):	2G and 5G, or 6G
5.	VERTICAL WELDING PROGRESSION:	Upward
6.	WELDING PROCEDURE:	GT11-1 (PP), welded without purge
7.	INSPECTION:	See paras. 3.6 D and E
8.	TESTS(S):	2G requires one face and one root bend; 5G or 6G requires two face and two root bends (ASME IX, para. QW-302.3); or, radiographic examination of four test coupons per ASME IX, para. QW-302.2

LIMITS OF QUALIFICATION:

1.	PROCESS:	GTAW, DCSP, with or without purge
2.	ELECTRODE/FILLER METAL:	F6
3.	BASE MATERIAL:	P1 through P11 and P4X
4.	POSITION(S):	All
5.	PIPE GROOVE WELD DIAM LIMITS:	0.540 in. OD (1/4 in. NPS) and larger
6.	JOINT TYPES:	Groove welds with or without backing or backgouged and fillet welds. Not consumable inserts
7.	DEPOSITED METAL THICKNESS:	Through 0.176 in.
8.	PRODUCT FORM:	Pipe, plate, and shapes

PIPE WELDING PERFORMANCE QUALIFICATION TEST (PQT)

TEST NUMBER: GT-6-O-1/2 REVISION 1

1.	WELDING PROCESS:	GTAW (Manual)
2.	ELECTRODE/FILLER MATERIAL:	ER70S-2 or ER70S-3 (F-number 6)
3.	BASE MATERIAL:	Carbon Steel Pipe (P-number 1), 1/2 in. NPS, Sch. 80 (0.147 in. W.T.) without backing
4.	WELDING POSITION(S):	2G and 5G, or 6G
5.	VERTICAL WELDING PROGRESSION:	Upward
6.	WELDING PROCEDURE:	GT11-1(PP), welded without purge
7.	INSPECTION:	See paras. 3.6 D and E
8.	TESTS(S):	2G requires one face and one root bend; 5G or 6G requires two face and two root bends (ASME IX, para. QW-302.3); or, radiographic examination of three test coupons per ASME IX, para. QW-302.2

LIMITS OF QUALIFICATION:

1.	PROCESS:	GTAW, DCSP, with or without purge
2.	ELECTRODE/FILLER METAL:	F6
3.	BASE MATERIAL:	P1 through P11 and P4X
4.	POSITION(S):	All
5.	PIPE GROOVE WELD DIAM LIMITS:	0.840 in. OD (1/2 in. NPS) and larger
6.	JOINT TYPES:	Groove welds with or without backing or backgouged and fillet welds. Not consumable inserts
7.	DEPOSITED METAL THICKNESS:	Through 0.294 in.
8.	PRODUCT FORM:	Pipe, plate, and shapes

PIPE WELDING PERFORMANCE QUALIFICATION TEST (PQT)

TEST NUMBER: GT-6-O-1		REVISION 1
1.	WELDING PROCESS:	GTAW (Manual)
2.	ELECTRODE/FILLER MATERIAL:	ER70S-2 or ER70S-3 (F-number 6)
3.	BASE MATERIAL:	Carbon Steel Pipe (P-number 1), 2 in. NPS, Sch. 80 (0.218 in. W.T.) without backing
4.	WELDING POSITION(S):	2G and 5G, or 6G
5.	VERTICAL WELDING PROGRESSION:	Upward
6.	WELDING PROCEDURE:	GT11-1 (PP), welded without purge
7.	INSPECTION:	See paras. 3.6 D and E
8.	TESTS(S):	2G requires one face and one root bend; 5G or 6G requires two face and two root bends (ASME IX, para. QW-302.3); or, radiographic examination per ASME IX, para. QW-302.2

LIMITS OF QUALIFICATION:

1.	PROCESS:	GTAW, DCSP, with or without purge
2.	ELECTRODE/FILLER METAL:	F6
3.	BASE MATERIAL:	P1 through P11 and P4X
4.	POSITION(S):	All
5.	PIPE GROOVE WELD DIAM LIMITS:	1 in. OD (3/4 in. NPS) and larger
6.	JOINT TYPES:	Groove welds with or without backing or backgouged and fillet welds. Not consumable inserts
7.	DEPOSITED METAL THICKNESS:	Through 0.436 in.
8.	PRODUCT FORM:	Pipe, plate, and shapes

PIPE WELDING PERFORMANCE QUALIFICATION TEST (PQT)

TEST NUMBER: GT-6-O-2 REVISION 1

1.	WELDING PROCESS:	GTAW (Manual)
2.	ELECTRODE/FILLER MATERIAL:	ER70S-2 or ER70S-3 (F-number 6)
3.	BASE MATERIAL:	Carbon Steel Pipe (P-number 1), 5 in. NPS, Sch. 80 (0.375 in. W.T.) without backing
4.	WELDING POSITION(S):	2G and 5G, or 6G
5.	VERTICAL WELDING PROGRESSION:	Upward
6.	WELDING PROCEDURE:	GT11-1 (PP), welded without purge
7.	INSPECTION:	See paras. 3.6 D and E
8.	TESTS(S):	2G requires two side bends or one face and one root bend; 5G or 6G requires four side bends or two face and two root bends (ASME IX, para. QW-302.3); or, radiographic examination per ASME IX, para. QW-302.2

LIMITS OF QUALIFICATION:

1.	PROCESS:	GTAW, DCSP, with or without purge
2.	ELECTRODE/FILLER METAL:	F6
3.	BASE MATERIAL:	P1 through P11 and P4X
4.	POSITION(S):	All
5.	PIPE GROOVE WELD DIAM LIMITS:	2 7/8 in. OD (2 1/2 in. NPS) and larger
6.	JOINT TYPES:	Groove welds with or without backing or backgouged and fillet welds. Not consumable inserts
7.	DEPOSITED METAL THICKNESS:	Through 0.750 in.
8.	PRODUCT FORM:	Pipe, plate, and shapes

PIPE WELDING PERFORMANCE QUALIFICATION TEST (PQT)

TEST NUMBER: GT-FC-O-1		REVISION 0
1.	WELDING PROCESS:	GTAW (Manual)
2.	ELECTRODE/FILLER MATERIAL:	ER308LFC (Flux-Coated Filler Metal Manufactured by Filler Metals Inc.)
3.	BASE MATERIAL:	Stainless Steel Pipe (P-number 8), 2 in. NPS, Sch. 80 (0.218 in. W.T.) without backing
4.	WELDING POSITION(S):	2G and 5G, or 6G
5.	VERTICAL WELDING PROGRESSION:	Upward
6.	WELDING PROCEDURE:	GT88-2 (PP), welded without purge
7.	INSPECTION:	See paras. 3.6 D and E
8.	TESTS(S):	2G requires one face and one root bend; 5G or 6G requires two face and two root bends (ASME IX, para. QW-302.3); or, radiographic examination per ASME IX, para. QW-302.2

LIMITS OF QUALIFICATION:

1.	PROCESS:	GTAW, DCSP, with or without purge
2.	ELECTRODE/FILLER METAL:	ER308LFC Flux-Coated Filler Metal
3.	BASE MATERIAL:	P8
4.	POSITION(S):	All
5.	PIPE GROOVE WELD DIAM LIMITS:	1 in. OD (3/4 in. NPS) and larger
6.	JOINT TYPES:	Groove welds without backing
7.	DEPOSITED METAL THICKNESS:	Through 0.436 in.
8.	PRODUCT FORM:	Pipe, plate, and shapes

PIPE WELDING PERFORMANCE QUALIFICATION TEST (PQT)

TEST NUMBER: GT-FC-O-2 REVISION 0

1.	WELDING PROCESS:	GTAW (Manual)
2.	ELECTRODE/FILLER MATERIAL:	ER308LFC (Flux-Coated Filler Metal Manufactured by Filler Metals Inc.)
3.	BASE MATERIAL:	Stainless Steel Pipe (P-number 1), 5 in. NPS, Sch. 80 (0.375 in. W.T.) without backing
4.	WELDING POSITION(S):	2G and 5G, or 6G
5.	VERTICAL WELDING PROGRESSION:	Upward
6.	WELDING PROCEDURE:	GT88-2 (PP), welded without purge
7.	INSPECTION:	See paras. 3.6 D and E
8.	TESTS(S):	2G requires two side bends or one face and one root bend; 5G or 6G requires four side bends or two face and two root bends (ASME IX, para. QW-302.3); or, radiographic examination per ASME IX, para. QW-302.2

LIMITS OF QUALIFICATION:

1.	PROCESS:	GTAW, DCSP, with or without purge
2.	ELECTRODE/FILLER METAL:	ER308LFC Flux-Coated Filler Metal
3.	BASE MATERIAL:	P8
4.	POSITION(S):	All
5.	PIPE GROOVE WELD DIAM LIMITS:	2 7/8 in. OD (2 1/2 in. NPS) and larger
6.	JOINT TYPES:	Groove welds without backing
7.	DEPOSITED METAL THICKNESS:	Through 0.750 in.
8.	PRODUCT FORM:	Pipe, plate, and shapes

PIPE WELDING PERFORMANCE QUALIFICATION TEST (PQT)

TEST NUMBER: GT-6-B-L — REVISION 2

1.	WELDING PROCESS:	GTAW (Manual)
2.	ELECTRODE/FILLER MATERIAL:	ER70S-2 or ER70S-3 (F-number 6)
3.	BASE MATERIAL:	Carbon Steel Plate (P-number 1), 3/8 in. thick X 3 in. wide X 6 in. long, with backing
4.	WELDING POSITION(S):	2G, 3G, and 4G
5.	VERTICAL WELDING PROGRESSION:	Upward
6.	WELDING PROCEDURE:	GT11-1 (PP) (R)
7.	INSPECTION:	See paras. 3.6 D and E
8.	TESTS(S):	Two side bends or one face and one root bend test from each test position per ASME IX, para. QW-302.1; or, radiographic examination per ASME IX, para. QW-302.2

LIMITS OF QUALIFICATION:

1.	PROCESS:	GTAW
2.	ELECTRODE/FILLER METAL:	F6
3.	BASE MATERIAL:	P1 through P11 and P4X
4.	POSITION(S):	All
5.	PIPE GROOVE WELD DIAM LIMITS:	Greater than 24 in. OD
6.	JOINT TYPES:	Groove welds with backing or backgouged and fillet welds
7.	DEPOSITED METAL THICKNESS:	Through 0.750 in.
8.	PRODUCT FORM	Pipe over 24-in. OD, plate, and shapes

PIPE WELDING PERFORMANCE QUALIFICATION TEST (PQT)

TEST NUMBER: GT-23-0-L REVISION 2

1.	WELDING PROCESS:	GTAW (Manual), ACHF
2.	ELECTRODE/FILLER MATERIAL:	ER4043 (F-number 23)
3.	BASE MATERIAL:	Aluminum Plate (P-number 23), 1/8 in. thick X 3 in. wide X 6 in. long, without backing
4.	WELDING POSITION(S):	2G, 3G, and 4G
5.	VERTICAL WELDING PROGRESSION:	Upward
6.	WELDING PROCEDURE:	GT23.23-1 (PP), welded with purge
7.	INSPECTION:	See paras. 3.6 D and E
8.	TESTS(S):	One face and one root bend test from each test position (ASME IX, para. QW-302.1); or, radiographic examination per ASME IX, para. QW-302.2

LIMITS OF QUALIFICATION:

1.	PROCESS:	GTAW, ACHF, welded with purge
2.	ELECTRODE/FILLER METAL:	F21 through F24
3.	BASE MATERIAL:	P21 through P25
4.	POSITION(S):	All
5.	PIPE GROOVE WELD DIAM LIMITS:	Greater than 24 in. OD
6.	JOINT TYPES:	Groove welds with or without backing or backgouged and fillet welds
7.	DEPOSITED METAL THICKNESS:	Through 0.250 in.
8.	PRODUCT FORM:	Pipe over 24-in. OD, plate, and shapes

PIPE WELDING PERFORMANCE QUALIFICATION TEST (PQT)

TEST NUMBER: GT-23-O-1 REVISION 1

1.	WELDING PROCESS:	GTAW (Manual), ACHF
2.	ELECTRODE/FILLER MATERIAL:	ER4043 (F-number 23)
3.	BASE MATERIAL:	Aluminum Pipe (P-number 23), 2 in. NPS, Sch. 40 (0.154 in. W.T.) without backing
4.	WELDING POSITION(S):	2G and 5G, or 6G
5.	VERTICAL WELDING PROGRESSION:	Upward
6.	WELDING PROCEDURE:	GT23.23-1 (PP), welded with purge
7.	INSPECTION:	See paras. 3.6 D and E
8.	TESTS(S):	2G requires one face and one root bend; 5G or 6G requires two face and two root bends (ASME IX, para. QW-302.3); or, radiographic examination per ASME IX, para. QW-302.2

LIMITS OF QUALIFICATION:

1.	PROCESS:	GTAW, ACHF, welded with purge
2.	ELECTRODE/FILLER METAL:	F21 through F24
3.	BASE MATERIAL:	P21 through P25
4.	POSITION(S):	All
5.	PIPE GROOVE WELD DIAM LIMITS:	1 in. OD (3/4 in. NPS) and larger
6.	JOINT TYPES:	Groove welds with or without backing or backgouged and fillet welds. Not consumable inserts
7.	DEPOSITED METAL THICKNESS:	Through 0.308 in.
8.	PRODUCT FORM:	Pipe, plate, and shapes

PIPE WELDING PERFORMANCE QUALIFICATION TEST (PQT)

TEST NUMBER: GT-23-O-2 REVISION 1

1.	WELDING PROCESS:	GTAW (Manual), ACHF
2.	ELECTRODE/FILLER MATERIAL:	ER4043 (F-number 23)
3.	BASE MATERIAL:	Aluminum Pipe (P-number 23), 5 in. NPS, Sch. 80 (0.375 in. W.T.) without backing
4.	WELDING POSITION(S):	2G and 5G, or 6G
5.	VERTICAL WELDING PROGRESSION:	Upward
6.	WELDING PROCEDURE:	GT23.23-1 (PP), welded with purge
7.	INSPECTION:	See paras. 3.6 D and E
8.	TESTS(S):	2G requires two side bends or one face and one root bend; 5G or 6G requires four side bends or two face and two root bends (ASME IX, para. QW-302.3); or, radiographic examination per ASME IX, para. QW-302.2

LIMITS OF QUALIFICATION:

1.	PROCESS:	GTAW, ACHF, welded with purge
2.	ELECTRODE/FILLER METAL:	F21 through F24
3.	BASE MATERIAL:	P21 through P25
4.	POSITION(S):	All
5.	PIPE GROOVE WELD DIAM LIMITS:	2 7/8 in. OD (2 1/2 in. NPS) and larger
6.	JOINT TYPES:	Groove welds with or without backing or backgouged and fillet welds
7.	DEPOSITED METAL THICKNESS:	Through 0.750 in.
8.	PRODUCT FORM:	Pipe, plate, and shapes

PIPE WELDING PERFORMANCE QUALIFICATION TEST (PQT)

TEST NUMBER: GT-23-B-LA — REVISION 1

1.	WELDING PROCESS:	GTAW (Manual), DCSP
2.	ELECTRODE/FILLER MATERIAL:	ER4043 (F-number 23)
3.	BASE MATERIAL:	Aluminum Plate (P-number 23), 3/8 in. thick X 3 in. wide X 6 in. long, with backing
4.	WELDING POSITION(S):	2G, 3G, and 4G
5.	VERTICAL WELDING PROGRESSION:	Upward
6.	WELDING PROCEDURE:	GT23.23-2 (PP) (R)
7.	INSPECTION:	See paras. 3.6 D and E
8.	TESTS(S):	One face and one root bend or two side bend tests from each test position ASME IX, para. QW-302.1); or, radiographic examination per ASME IX, para. QW-302.2

LIMITS OF QUALIFICATION:

1.	PROCESS:	GTAW, DCSP
2.	ELECTRODE/FILLER METAL:	F21 through F24
3.	BASE MATERIAL:	P21 through P25
4.	POSITION(S):	All
5.	PIPE GROOVE WELD DIAM LIMITS:	Greater than 24-in. OD
6.	JOINT TYPES:	Groove welds with or without backing or backgouged and fillet welds
7.	DEPOSITED METAL THICKNESS:	Through 0.750 in.
8.	PRODUCT FORM:	Pipe over 24-in. OD, plate, and shapes

PIPE WELDING PERFORMANCE QUALIFICATION TEST (PQT)

TEST NUMBER: GT-23-O-1A REVISION 1

1.	WELDING PROCESS:	GTAW (Manual), DCSP
2.	ELECTRODE/FILLER MATERIAL:	ER4043 (F-number 23)
3.	BASE MATERIAL:	Aluminum Pipe (P-number 23), 2 in. NPS, Sch. 40 (0.154 in. W.T.) without backing
4.	WELDING POSITION(S):	2G and 5G, or 6G
5.	VERTICAL WELDING PROGRESSION:	Upward
6.	WELDING PROCEDURE:	GT23.23-2 (PP), welded with purge
7.	INSPECTION:	See paras. 3.6 D and E
8.	TESTS(S):	2G requires one face and one root bend; 5G or 6G requires two face and two root bends (ASME IX, para. QW-302.3); or, radiographic examination per ASME IX, para. QW-302.2

LIMITS OF QUALIFICATION:

1.	PROCESS:	GTAW, DCSP, welded with purge
2.	ELECTRODE/FILLER METAL:	F21 through F24
3.	BASE MATERIAL:	P21 through P25
4.	POSITION(S):	All
5.	PIPE GROOVE WELD DIAM LIMITS:	1 in. OD (3/4 in. NPS) and larger
6.	JOINT TYPES:	Groove welds with or without backing or backgouged and fillet welds. Not consumable inserts
7.	DEPOSITED METAL THICKNESS:	Through 0.308 in.
8.	PRODUCT FORM:	Pipe, plate, and shapes

PIPE WELDING PERFORMANCE QUALIFICATION TEST (PQT)

TEST NUMBER: GT-23-O-2A REVISION 2

1.	WELDING PROCESS:	GTAW (Manual), DCSP
2.	ELECTRODE/FILLER MATERIAL:	ER4043 (F-number 23)
3.	BASE MATERIAL:	Aluminum Pipe (P-number 23), 5 in. NPS, Sch. 80 (0.375 in. W.T.) without backing
4.	WELDING POSITION(S):	2G and 5G, or 6G
5.	VERTICAL WELDING PROGRESSION:	Upward
6.	WELDING PROCEDURE:	GT23.23-2 (PP), welded with purge
7.	INSPECTION:	See paras. 3.6 D and E
8.	TESTS(S):	2G requires two side bends or one face and one root bend; 5G or 6G requires four side bends or two face and two root bends (ASME IX, para. QW-302.3); or, radiographic examination per ASME IX, para. QW-302.2

LIMITS OF QUALIFICATION:

1.	PROCESS:	GTAW, DCSP, welded with purge
2.	ELECTRODE/FILLER METAL:	F21 through F24
3.	BASE MATERIAL:	P21 through P25
4.	POSITION(S):	All
5.	PIPE GROOVE WELD DIAM LIMITS:	2 7/8 in. OD (2 1/2 in. NPS) and larger
6.	JOINT TYPES:	Groove welds with or without backing or backgouged and fillet welds. Not consumable inserts
7.	DEPOSITED METAL THICKNESS:	Through 0.750 in.
8.	PRODUCT FORM:	Pipe, plate, and shapes

PIPE WELDING PERFORMANCE QUALIFICATION TEST (PQT) (N)

TEST NUMBER: GM-6-B-L REVISION 0

1.	WELDING PROCESS:	GMAW (Semiautomatic), DCRP
2.	ELECTRODE/FILLER MATERIAL:	ER308L (F-number 6)
3.	BASE MATERIAL:	Stainless Steel Plate (P-number 8), 3/8 in. thick X 3 in. wide X 6 in. long, with backing
4.	WELDING POSITION(S):	2G, 3G, and 4G
5.	VERTICAL WELDING PROGRESSION:	Upward
6.	WELDING PROCEDURE:	GM88-1 (PP)
7.	INSPECTION:	See paras. 3.6 D and E
8.	TESTS(S):	One face and one root bend or two side bend tests from each test position ASME IX, para. QW-302.1); or, radiographic examination per ASME IX, para. QW-302.2

LIMITS OF QUALIFICATION:

1.	PROCESS:	GMAW
2.	ELECTRODE/FILLER METAL:	F6
3.	BASE MATERIAL:	P1 through P11
4.	POSITION(S):	All
5.	PIPE GROOVE WELD DIAM LIMITS:	Greater than 24-in. OD
6.	JOINT TYPES:	Groove welds with backing or backgouged and fillet welds
7.	DEPOSITED METAL THICKNESS:	Through 0.750 in.
8.	PRODUCT FORM:	Pipe over 24-in. OD, plate, and shapes

PIPE WELDING PERFORMANCE QUALIFICATION TEST (PQT)

TEST NUMBER: GM-23-B-L — REVISION 1

1.	WELDING PROCESS:	GMAW (Semiautomatic), DCRP
2.	ELECTRODE/FILLER MATERIAL:	ER4043 (F-number 23)
3.	BASE MATERIAL:	Aluminum Plate (P-number 23), 3/8 in. thick X 3 in. wide X 6 in. long, with backing
4.	WELDING POSITION(S):	2G, 3G, and 4G
5.	VERTICAL WELDING PROGRESSION:	Upward
6.	WELDING PROCEDURE:	GM23.23-1 (PP)
7.	INSPECTION:	See paras. 3.6 D and E
8.	TESTS(S):	One face and one root bend or two side bend tests from each test position ASME IX, para. QW-302.1); or, radiographic examination per ASME IX, para. QW-302.2

LIMITS OF QUALIFICATION:

1.	PROCESS:	GMAW
2.	ELECTRODE/FILLER METAL:	F21 through F24
3.	BASE MATERIAL:	P21 through P25
4.	POSITION(S):	All
5.	PIPE GROOVE WELD DIAM LIMITS:	Greater than 24-in. OD
6.	JOINT TYPES:	Groove welds with backing or backgouged and fillet welds
7.	DEPOSITED METAL THICKNESS:	Through 0.750 in.
8.	PRODUCT FORM:	Pipe over 24-in. OD, plate, and shapes

PIPE WELDING PERFORMANCE QUALIFICATION TEST (PQT)

TEST NUMBER: GM-23-B5S-2		REVISION 0
1.	WELDING PROCESS:	GMAW (Semiautomatic), DCRP
2.	ELECTRODE/FILLER MATERIAL:	ER4043 (F-number 23)
3.	BASE MATERIAL:	Aluminum Pipe (P-number 23), 5 in. NPS, Sch. 40 (0.258 in. W.T.) with backing
4.	WELDING POSITION(S):	2G and 5G, or 6G
5.	VERTICAL WELDING PROGRESSION:	Upward
6.	WELDING PROCEDURE:	GM23.23-1 (PP)
7.	INSPECTION:	See paras. 3.6 D and E
8.	TESTS(S):	2G requires one face and one root bend; 5G or 6G requires two face and two root bends (ASME IX, para. QW-302.3); or, radiographic examination per ASME IX, para. QW-302.2 (R)

LIMITS OF QUALIFICATION:

1.	PROCESS:	GMAW
2.	ELECTRODE/FILLER METAL:	F21 through F24
3.	BASE MATERIAL:	P21 through P25
4.	POSITION(S):	All
5.	PIPE GROOVE WELD DIAM LIMITS:	2 7/8 in. OD (2 1/2 in. NPS) and larger
6.	JOINT TYPES:	Groove welds with backing or backgouged and fillet welds
7.	DEPOSITED METAL THICKNESS:	Through 0.516 in.
8.	PRODUCT FORM:	Pipe plate and shapes

END OF SECTION 18360